



NASA SBIR 2005 Phase I Solicitation

S1.04 Entry, Descent and Landing

Lead Center: JPL

Participating Center(s): ARC, JSC, LaRC

Entry, Descent, and Landing (EDL) systems are an enabling component of future planetary surface and airborne explorations. EDL systems are naturally comprised of a wide variety of tightly integrated subsystems. These subsystems can include, but are not limited to: entry body, thermal protection, avionics for guidance during entry and/or powered descent (including terrain sensors), aerodynamic decelerators including supersonic or subsonic parachutes, and touch-down systems. In addition to these hardware specific subsystems, algorithms for guidance and hazard detection are an integral element of future EDL systems. Innovations are sought that provide benefits in the following general areas: increased payload delivery mass, improved delivery accuracy, and improved hazard detection and avoidance. The intended outcome of these improvements is to develop the capability to land safely within 100m or less of a preselected landing site and to deliver larger payloads for future Mars missions. In particular, this subtopic seeks technology innovations in the following areas:

- Entry body systems and subsystems including lightweight aeroshells and thermal protection;
- Entry guidance algorithms/methods/techniques capable of reducing uncertainty in parachute deployment altitude, for missions employing bank-only control (i.e., no control of angle of attack) during hypersonic entry;
- Aerodynamic decelerator systems including supersonic and subsonic parachutes. Particular areas of interest include approaches that hold promise for delivering increased mass to the surface (e.g., increasing the Mach-Q deployment envelope beyond Viking-heritage capability) and techniques of reducing the cost of testing/validating the performance of new aerodynamic decelerator systems for use at Mars. Also of interest are para-guidance techniques for pinpoint landing;
- Terrain hazard detection approaches that provide real-time three-dimensional terrain mapping capability during parachute descent and powered terminal descent. In addition, compact, low-mass, high accuracy, and high bandwidth GNC sensors such as attitude and velocity sensors are highly desirable; and
- Lightweight, low-cost, hazard-tolerant touchdown system approaches including (but not limited to) airbag, shock struts, and structural crush zones; allowing landings in moderately cratered terrains with surface rock distribution encountered over a wide variety of Martian landing sites.